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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Stephen V. R. Hellriegel et al.
Application No. : 09/705,369
Filed : November 3, 2000
For : ALIGNMENT MARK FOR PLACEMENT OF GUIDE HOLE

Examiner : Jeremy C. Norris
Art Unit : 2827
Docket No. : 901115.431
Date : November 14, 2002

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AMENDMENT

Commissioner for Patents:

In response to the Office Action dated August 14, 2002, please amend the application as follows:

In the Claims:

For the convenience of the Examiner, all pending claims have been included.

Please amend claims 18, 31 and 32 to read as follows:

15. An electronic connector, comprising:
a flexible substrate;
a plurality of features positioned on said substrate with reference to a first set of registration guides;
an additional feature positioned on said substrate with reference to said first set of registration guides;

a second set of registration guides positioned on said substrate concurrently with said additional feature; and

a second additional feature positioned on said substrate with reference to said second set of registration guides.

16. The connector according to claim 15 wherein said plurality of features includes a plurality of electrically conductive traces.

17. The connector according to claim 15 wherein said plurality of features includes a plurality of electrodes.

18. (Amended) The connector according to claim 17 wherein said plurality of features includes a plurality of electrically conductive traces, and wherein each of said plurality of electrodes is in electrical contact with a corresponding one of said plurality of electrically conductive traces.

19. The connector according to claim 17 wherein a plurality of micro-pads are positioned on each of said plurality of electrodes.

20. The connector according to claim 19 wherein said plurality of micro-pads comprises said additional feature.

21. The connector according to claim 15 wherein said additional feature and said second set of registration guides are formed by plating a conductive metal on said flexible substrate.

22. the connector according to claim 15 wherein said second additional feature is a plurality of alignment holes.

23. The connector according to claim 15 wherein said concurrent positioning of said additional feature and said second set of registration guides results in a fixed and known positional relationship between the additional feature and the second set of registration guides.

24. The connector according to claim 23 wherein said positioning of said plurality of features with reference to said first set of registration guides results in a positional relationship fixed within known tolerances between any two of said plurality of features.

25. The connector according to claim 24 wherein said positional relationship between said additional feature and said second additional feature is fixed and known with a high degree of confidence as compared to said positional relationship between any two of said plurality of features.

26. An electronic connector, comprising:
a flexible substrate;
a plurality of electrodes positioned on said substrate with reference to a first set of registration guides,
a first additional feature positioned on said substrate with reference to said first set of registration guides;
a second set of registration guides positioned on said substrate concurrently with said additional feature;
a second additional feature positioned on said substrate with reference to said second set of registration guides; and
a plurality of micro-pads positioned on each of said plurality of electrodes.

27. The connector according to claim 26 wherein said plurality of micro-pads comprises the first additional feature.

28. An electronic connector, comprising:
a flexible substrate;

a first set of registration guides on the flexible substrate;
a plurality of first features positioned on said substrate with reference to the first set of registration guides;
a second feature positioned on said substrate with reference to said first set of registration guides;
a second set of registration guides positioned on said substrate concurrently with said second feature; and
a plurality of alignment holes positioned on said substrate with reference to said second set of registration guides.

29. An electronic connector, comprising:
a flexible substrate;
a first set of registration guides on the flexible substrate;
a plurality of first features positioned on said substrate with reference to the first set of registration guides;
a second feature positioned on said substrate with reference to said first set of registration guides;
a second set of registration guides positioned on said substrate concurrently with said second feature; and
a plurality of third features positioned on said substrate with reference to said second set of registration guides.

30. A device, comprising:
a flexible substrate, the substrate being divided into a plurality of segments;
a first set of alignment marks on the substrate;
a plurality of features positioned on each of the plurality of segments of the substrate with reference to the first set of alignment marks;
an additional set of alignment marks positioned on each of the plurality of segments with respect to the first set of alignment marks; and

an additional feature positioned on each of the plurality of segments, the additional feature on each segment positioned with respect to the addition set of alignment marks of the respective segment.

31. (Amended) The device of claim 30 wherein each of the plurality of segments is a flexible connector.

32. (Amended) The device of claim 30, further comprising a second additional feature positioned on each of the plurality of segments with respect to the additional set of alignment marks of the respective segment.

REMARKS

Claims 15-32 will be pending upon entry of the present amendment. Claims 18, 31, and 32 are amended.

Applicants thank the Examiner for indicating the allowability of claims 26-28 and 30, and for indicating the allowability of the subject matter of claims 19, 20, 22, 31, and 32.

The Examiner has rejected claims 18, 31, and 32 under 35 U.S.C. § 112, second paragraph as being indefinite. Accordingly, claim 18 has been amended to provide antecedent basis for the limitation “the said plurality of electrically conductive traces,” claim 31 has been amended to depend from claim 30, claim 32 has been amended to depend from claim 30 and to recite “the plurality of segments.” The amendments made to claims 18, 31, and 32 are made to correct drafting errors, and do not affect the scope of the claims.

The Examiner has rejected claims 15-18, 21, 23-25, and 29 under 35 U.S.C. § 103(a) as being unpatentable over Colelli et al. (U.S. Patent No. 6,342,735) in view of Tagusa et al. (U.S. Patent No. 5,822,191).

The applicants feel that a brief description of some of the advantages of an embodiment of the invention will help the Examiner in understanding the claimed invention. As is known in the art, when forming features on an electronic substrate, masks are used, through which the substrate is exposed as part of the process of forming features on the substrate. Generally, multiple masks are required to form different features on the substrate. In order to

position these different features correctly, relative to one another, registration marks are first formed on the substrate, to which subsequent masks are aligned, or registered. An acceptable tolerance is selected, within which each of the masks must be aligned. For example, if the tolerance is x , a first feature formed on the substrate must be in the correct position to within the distance x , in any direction. Consequently, it is possible for a first feature to be out of alignment in a first direction up to the value x , while a second feature may be out of alignment in an opposite direction up to the value x , resulting in that the first and second features may be out of alignment with reference to each other a distance of up to $2x$, while remaining nominally within tolerances. This is understood in the art and tolerances are selected to accommodate this possibility. If there are features on a given device that must be more precisely positioned relative to each other than any other features, say within a distance y , it is this degree of required precision that will dictate the tolerance—about $.5y$ —to be allowed in manufacturing of the given device, without regard to more relaxed tolerances that might otherwise be acceptable with respect to the positioning of other features on the device. It will be understood that the closer the degree of tolerance required in manufacturing a device, the greater the expense of that manufacture will be, due to the greater difficulty in achieving the higher precision as well as the higher number of rejections that will be encountered.

An embodiment of the invention provides for a second set of registration marks to be formed on a substrate concurrently with the formation of one of the features on the substrate. Subsequently, a second feature is positioned on the substrate with reference to the second set of registration marks. Thus, while the first feature may have a variance of position up to the selected value x , relative to the first set of registration marks, the positional variance between the first feature and the second set of registration marks will be very nearly zero, inasmuch as they were formed concurrently and using the same mask. Therefore, when a second feature is formed with reference to the second set of registration marks, the variance of position between the first feature and the second feature will be no greater than the value x , rather than the value $2x$, as might happen had the second feature been formed with reference to the first set of registration marks. In this way, a closer tolerance may be achieved between two features, or groups of features, without adversely affecting the overall cost of the device.

In rejecting claim 15, the Examiner has cited Colelli et al. in view of Tagusa et al., stating that Colelli et al. teaches all of the limitations of claim 15, with the exception of the flexible substrate. The Examiner cites Figure 4a as showing the elements claimed in claim 15; namely, the substrate (20), a plurality of features (42') positioned on said substrate with reference to a first set of registration guides (22'), an additional feature (not shown but referred to) positioned on said substrate with reference to said first set of registration guides, a second set of registration guides (26) positioned on said substrate concurrently with said additional feature, and a second additional feature (the diagonal traces over 26) positioned on said substrate with reference to said second said of registration guides. However, a careful examination of the text of Colelli et al. shows that the entire image of Figure 4a, indicated generally at reference numeral 50, is a single alignment mark, which incorporates characteristics of two different types of alignment marks for the purpose of being detectable by two different kinds of imaging equipment (column 4, lines 12-14). Additionally, Colelli et al. makes clear that the entire alignment mark 50 is formed using a single mask, as described in column 4, lines 21-26. Thus, Colelli et al. fails to teach each of the features of claim 15, but rather teaches only a first alignment mark, and features formed therefrom. Colelli et al. actually teaches away from the use of multiple alignment marks, saying "it is an advantage of the present invention that kerf area is saved by combining alignment marks into a single alignment mark." An understanding of the purpose for the various features of Colelli et al.'s alignment mark 50 may be gained by referring to Colelli et al.'s text, which teaches that alignment marks in general "typically consist of narrow bars or gratings oriented to provide x and y positioning information" (column 1, line 57), and that, in particular, the lines 22' and 24' of Figure 4b are for x and y alignment of an ASML imaging device, while the diagonal features 42' and the unnumbered diagonal traces over 26 are for x and y alignment of an SVGL imaging device (column 3, lines 44, 45 and 64, and column 4, lines 12-14, and 22-34). For at least the reasons listed above, applicants feel that Colelli et al. fails to teach or suggest the limitations of claim 15, which is therefore allowable over the cited art. Claims 16-25, which are dependent upon claim 15, are therefore also allowable.

While the language of claim 29 differs from that of claim 15, applicants feel that the arguments put forward in support of claim 15 may also be used in support of the allowability of claim 29. In particular, Colelli fails to teach the formation of a second set of registration

guides positioned concurrently with a second feature, and a plurality of third features positioned with reference to said second set of registration guides. Claim 29 is therefore allowable over the cited prior art.

Applicants wish to correct a misstatement made in the amendment of May 21, 2002, where, on page 5, second paragraph of REMARKS, applicants stated that new claims 26-32 were submitted, incorporating the matter of claims 19-22. In fact, claims 26-28 incorporate the matter of claims 19, 20, and 22, respectively, while claims 29-32 do not specifically incorporate any of the matter of those claims. This was an unintended error which clearly did not unduly influence the Examiner, inasmuch as those claims were given full attention in the recent Office Action.

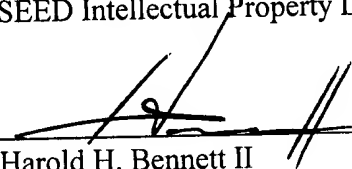
Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Version With Markings to Show Changes Made.**"

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,

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